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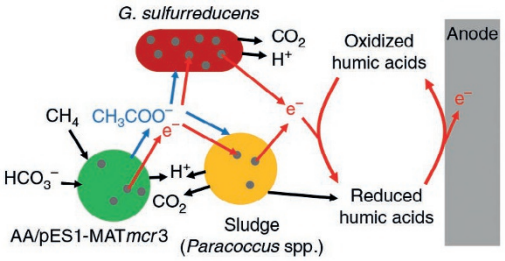
IN BRIEF

BIOCATALYSIS

Microbial communities synergize to split methane



Generating electricity from methane at its source would circumvent the problem of methane leakage during shale extraction, transport and storage. Microbial fuel cells (MFCs), in which microorganisms extract electrons from organic substrates, could provide the means for this 'at-source' electricity generation. So far, the electrical currents generated by MFCs running on methane have been very low. However, Thomas Wood and colleagues describe in *Nature Communications* a MFC that converts methane into electricity with high Coulombic efficiency.

To achieve this high efficiency, the team use a consortium of microorganisms in which each strain has a key role in generating current. Engineered *Methanosarcina acetivorans* expresses methyl-coenzyme M reductase, which oxidizes methane to acetate. *Geobacter sulfurreducens* consumes this acetate, generating carbon dioxide and electrons. A third component, methane-acclimated wastewater sludge (containing various genera), acts as a source of soluble electron shuttles — molecules that are enlisted by *G. sulfurreducens* to transfer electrons to the carbon-fibre anode. This indirect electron transfer is unusual for *G. sulfurreducens*, which typically transfers electrons directly, and suggests that the anode surface is not accommodating to the bacteria. To complete the fuel cell, ferricyanide is reduced to ferrocyanide at the cathode.

The Coulombic efficiency of this MFC is high (90 ± 10%), meaning that most of the electrons generated are successfully transferred to the cathode. This approach will benefit from optimization of different microbial consortia and the development of new electrode materials, for which a better understanding of the catalytic mechanism is important. Such research could lead to feasible MFCs and enable the conversion of methane into more useful products.

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ORIGINAL ARTICLE McAnulty, M. J. et al. Electricity from methane by reversing methanogenesis. *Nat. Commun.* **8**, 15419 (2017)